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WATER CONSUMPTION IN ARMY CAMPS

BY GEORGE A. JOHNSON ¹

When the original sixteen National Army cantonments were planned, the designs of the water supply systems were based on an average consumption of 55 gallons per capita daily, with allowance for maximum rates of withdrawal equal to 2.85 times the average, the latter to cover peak loads. For the distribution systems wood stave pipe was used very extensively, although at some camps, notably Camps Funston and Dix, considerable cast-iron was employed. Table 1 is given here as an interesting exhibition of the varieties of pipe used and the lack of uniform use of any sizes. The constructing engineers were glad to get any pipe which would deliver the necessary quantities of water.

Table 2 shows the average daily water consumption in all the National Army cantonments. During the early months of 1918 the average daily allowance of 55 gallons per capita was exceeded by the actual consumption in all the cantonments except Camp Sherman and Camp Taylor.

The earliest activities of the Utilities Division were directed toward keeping the average water consumption within, or reasonably close to, the allowance of 55 gallons. In this it was successful to a marked degree, as disclosed by the decreasing consumption throughout the year 1918 as shown in figure 1. Lieutenant (now Captain) Walter H. Van Winkle was in direct charge of this work. It was necessary to conserve water and curtail waste for the reason that unlimited use of water would leave no reserve for fire protection, shut-downs, etc. It was furthermore wise for obvious reasons of economy. Undue leakage in the pipe distribution system, wanton or careless waste and defective plumbing fixtures, are all remediable without deleterious effect on the service.

Posters were printed urging the troops to conserve water, but probably the best results of the campaign followed vigorous plumb-

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ing inspection and repair of leaks. It also developed during this campaign that the one sure method of reducing water consumption was not by moral suasion or punishment for infraction of orders, but by prompt repair of leaks disclosed by constant inspection, and by setting up mechanical barriers against the undue use of water by the troops.

Orders were issued prohibiting the dangerous practice of partially closing valves on main lines to reduce pressure, for without prompt

TABLE 1
Water Distribution Systems in National Army Cantonments

| CAMP | LOCATION | TOTAL MILES OF PIPE | PERCENTAGE OF DIFFERENT SIZES | | | | | | |
|--------------|----------------|---------------------------|-------------------------------|--------|--------|---------|---------|---------|---------|
| | | | 4-inch | 6-inch | 8-inch | 10-inch | 12-inch | 14-inch | 16-inch |
| Custer..... | Michigan | 14.7 | 0 | 26 | 12 | 25 | 37 | 0 | 0 |
| Devens..... | Massachusetts | 25.4 | 2 | 18 | 57 | 13 | 10 | 0 | 0 |
| Dix..... | New Jersey | 19.3 | 0 | 23 | 43 | 0 | 14 | 0 | 20 |
| Dodge..... | Iowa | 16.0 | 0 | 32 | 18 | 15 | 29 | 6 | 0 |
| Funston..... | Kansas | 19.8 | 14 | 15 | 47 | 8 | 13 | 2 | 1 |
| Gordon..... | Georgia | 15.4 | 3 | 19 | 38 | 28 | 10 | 1 | 1 |
| Grant..... | Illinois | 19.4 | 0 | 21 | 23 | 30 | 24 | 1 | 1 |
| Jackson..... | South Carolina | 26.2 | 1 | 32 | 45 | 1 | 7 | 0 | 14 |
| Lee..... | Virginia | 20.7 | 0 | 25 | 6 | 19 | 28 | 0 | 22 |
| Lewis..... | Washington | 22.7 | 4 | 27 | 9 | 29 | 14 | 17 | 0 |
| Meade..... | Maryland | 20.3 | 0 | 23 | 30 | 20 | 26 | 1 | 0 |
| Pike..... | Arkansas | 25.6 | 1 | 16 | 45 | 14 | 2 | 0 | 22 |
| Sherman..... | Ohio | 15.1 | 2 | 23 | 36 | 33 | 2 | 4 | 0 |
| Taylor..... | Kentucky | 16.8 | 1 | 15 | 44 | 17 | 23 | 0 | 0 |
| Travis..... | Texas | 17.2 | 5 | 54 | 24 | 0 | 12 | 0 | 5 |
| Upton..... | New York | 21.2 | 4 | 29 | 14 | 36 | 2 | 14 | 1 |

re-opening of such valves disaster might follow in consequence should fire break out in the camp. One most successful means of reducing waste was the use of some sort of device in each faucet and shower head whereby rates of delivery by these fixtures were reduced. For this purpose the most popular method was the insertion of a tapered lead plug with an orifice varying from $\frac{1}{16}$ -inch to $\frac{3}{32}$ -inch in size, depending on the pressure. This was inexpensive and easily installed and was markedly effective. The lowering of float balls in toilet flush tanks produced a large water saving.

TABLE 2
Water Consumption in the Sixteen National Army Cantonments

| MONTH (1918) | AVERAGE DAILY MILITARY POPULATION PER CAMP | TOTAL DAILY MILITARY POPULATION | TOTAL DAILY WATER CONSUMPTION | AVERAGE DAILY PER CAPITA WATER CONSUMPTION |
|-----------------|---|---------------------------------------|-------------------------------------|---|
| | | | <i>million gallons</i> | <i>gallons</i> |
| January..... | 28,000 | 449,000 | 31.9 | 71.2 |
| February..... | 27,300 | 436,000 | 29.6 | 67.6 |
| March..... | 28,900 | 463,000 | 34.7 | 75.0 |
| April..... | 30,400 | 487,000 | 30.8 | 63.2 |
| May..... | 34,800 | 559,000 | 34.2 | 61.3 |
| June..... | 35,100 | 561,000 | 34.9 | 62.0 |
| July..... | 36,400 | 583,000 | 35.1 | 60.2 |
| August..... | 40,100 | 643,000 | 35.4 | 55.0 |
| September..... | 42,400 | 679,000 | 33.8 | 50.0 |
| October..... | 37,031 | 592,500 | 33.4 | 53.0 |
| November..... | 35,625 | 570,000 | 31.8 | 56.7 |
| December..... | 29,312 | 469,000 | 29.8 | 66.1 |
| Averages..... | 33,780 | 540,000 | 33.0 | 60.9* |

* Weighted.

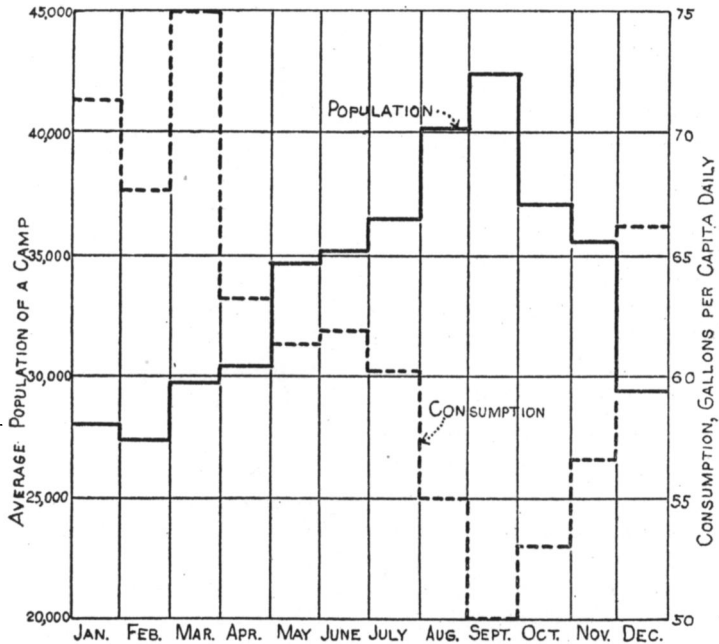


FIG. 1. AVERAGE MONTHLY POPULATION AND WATER CONSUMPTION IN AN ARMY CANTONMENT DURING 1918

Explanatory of the data in table 3, it will be noted that as the troop population decreased the per capita water consumption increased. This was due to a variety of reasons, among which were:

a. Overhead consumption which was a fairly constant factor; and overhead leakage. It might happen that the withdrawal of troops and consequent reduction in personnel would not be accompanied by a proportional reduction in the number of animals. These comments apply to conditions prior to the armistice.

b. Following the armistice, the morale of the troops relaxed and a material increase in water waste resulted, due to mischievous and in some instances malicious breaking of plumbing fixtures and from allowing taps to remain open and running. Furthermore, with demobilization activities going on and camp population decreasing in consequence, the absolute necessity of keeping the per capita consumption down became a matter of less importance.

The tabulation will show that the average per capita consumption in the sixteen National Army cantonments was about 61 gallons daily, instead of the prescribed 55 gallons. By and large it is not probable that this figure could be reduced under similar conditions, even in the face of the fact that the records from some camps are so good, notably Camps Devens, Dix, Dodge, Funston, Meade, Sherman and Taylor, and so comparatively unsatisfactory at other camps, notably Camp Grant. The high water consumption at Camp Travis was in some measure excusable, for the purchase cost was low and the supply practically without limit.

It is of particular interest, nevertheless, to note that the allowance of 55 gallons per capita was reasonable, and with a tighter distribution system and close attention paid to repair of leaks, as was the practice for the greater part of the year 1918, no difficulty should be experienced in keeping the per capita water consumption within the 55 gallon limit and still provide satisfactory water service for all uses in army establishments of this type.

TABLE 3
Average troop population and average daily consumption of water in gallons per capita in each of the sixteen National Army cantonments during 1918

| CAMP | ITEM | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER | AVERAGE |
|--------------|-------------|---------|----------|--------|--------|--------|--------|--------|--------|-----------|---------|----------|----------|---------|
| Custer..... | Population | 23,000 | 22,000 | 17,000 | 25,000 | 29,000 | 34,000 | 24,000 | 30,500 | 39,500 | 42,000 | 37,500 | 32,500 | 29,700 |
| | Consumption | 92 | 97 | 106 | 77 | 61 | 54 | 67 | 54.5 | 41 | 50.5 | 58 | 62 | 64* |
| Devens..... | Population | 28,000 | 26,000 | 28,000 | 33,000 | 38,000 | 44,000 | 28,000 | 38,000 | 45,000 | 44,000 | 40,000 | 39,000 | 35,900 |
| | Consumption | 73 | 70 | 69 | 51 | 47 | 41 | 56 | 53 | 43 | 46 | 51 | 71 | 54.3* |
| Dodge..... | Population | 20,000 | 22,000 | 31,000 | 23,000 | 30,000 | 32,500 | 41,500 | 33,500 | 29,500 | 33,500 | 27,500 | 22,500 | 28,900 |
| | Consumption | 74 | 58.5 | 47.5 | 57 | 57 | 54 | 50.5 | 53.5 | 47 | 42.5 | 40.5 | 43.5 | 52.7* |
| Dix..... | Population | 23,000 | 21,000 | 27,000 | 36,000 | 42,000 | 39,000 | 53,000 | 56,000 | 53,000 | 38,000 | 27,000 | 20,000 | 32,250 |
| | Consumption | 68 | 67.5 | 57 | 60 | 57 | 49 | 43 | 42 | 49 | 53 | 66 | 70 | 53.8* |
| Funston..... | Population | 29,500 | 28,500 | 27,500 | 31,500 | 36,000 | 21,500 | 28,500 | 37,500 | 38,000 | 41,000 | 45,000 | 39,000 | 33,600 |
| | Consumption | 63 | 58.5 | 49 | 46 | 49 | 70 | 53.5 | 51 | 43 | 49 | 46 | 50 | 51.3* |
| Gordon..... | Population | 35,000 | 33,000 | 35,000 | 33,000 | 34,000 | 37,000 | 40,000 | 43,000 | 42,000 | 32,000 | 26,000 | 20,000 | 34,200 |
| | Consumption | 71 | 70 | 68 | 67 | 68 | 64 | 63 | 59 | 57 | 64 | 66 | 79 | 65.5* |
| Grant..... | Population | 26,500 | 25,500 | 29,500 | 29,500 | 33,500 | 34,000 | 40,000 | 39,500 | 40,500 | 42,000 | 33,000 | 29,500 | 33,580 |
| | Consumption | 124.5 | 124 | 100 | 98 | 85 | 81 | 72.5 | 69.5 | 57 | 70 | 85 | 98 | 85.6* |
| Jackson..... | Population | 21,000 | 20,000 | 24,000 | 29,000 | 30,000 | 40,000 | 43,000 | 42,000 | 45,000 | 35,000 | 33,000 | 32,000 | 32,800 |
| | Consumption | 90 | 85 | 75 | 60 | 69 | 64 | 59 | 57 | 50 | 57 | 54 | 60 | 62.5* |

| | | | | | | | | | | | | | | |
|---------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| Lee.....{ | Population Consumption | 27,000 80 | 30,000 74 | 30,500 72 | 35,000 68 | 39,000 73 | 45,000 55 | 50,000 48 | 47,000 57 | 52,000 52 | 49,000 59 | 40,000 65 | 40,000 62 | 40,400 62.2* |
| Lewis.....{ | Population Consumption | 33,500 59 | 31,500 63.5 | 27,500 68.5 | 32,000 59 | 41,000 58 | 43,500 59 | 26,000 73.5 | 30,500 67.5 | 39,500 60 | 36,500 55 | 35,500 55 | 32,500 51.5 | 34,100 60.4* |
| Meade.....{ | Population Consumption | 35,500 58 | 30,000 65 | 32,000 58 | 30,000 58.5 | 37,000 57 | 41,000 48 | 32,000 58 | 43,000 48 | 44,000 43 | 44,000 48 | 44,000 44 | 38,000 49 | 37,600 52* |
| Pike.....{ | Population Consumption | 31,000 64 | 29,000 61 | 31,000 62 | 29,000 65 | 35,000 67 | 30,000 87 | 40,000 62 | 48,000 40 | 55,000 38 | 55,000 41 | 40,000 57 | 29,000 76 | 33,500 58.9* |
| Sherman.....{ | Population Consumption | 33,000 53.5 | 33,000 44 | 27,000 47 | 33,500 40.5 | 37,500 42.5 | 23,500 57.5 | 35,500 52.5 | 39,000 49.5 | 34,000 47.5 | 36,500 50 | 34,000 53 | 22,000 71 | 32,500 49.9* |
| Taylor.....{ | Population Consumption | 25,500 41.5 | 25,500 46.5 | 26,000 52.5 | 22,500 59.5 | 30,000 56 | 28,500 68 | 34,000 57.5 | 45,000 46.5 | 54,500 36 | 49,500 42 | 46,500 42.5 | 27,000 56 | 34,500 48.6* |
| Travis.....{ | Population Consumption | 29,000 90 | 28,500 93.5 | 32,000 82.5 | 30,000 73.5 | 38,500 64 | 28,500 86 | 29,500 81 | 32,500 80 | 37,000 59 | 34,500 69.5 | 35,000 67 | 27,000 89.5 | 31,800 77* |
| Upton.....{ | Population Consumption | 32,000 69 | 32,000 64 | 36,000 67 | 32,000 73 | 31,000 65 | 38,000 58 | 37,000 49 | 38,000 46 | 39,000 44 | 30,000 52 | 26,000 57 | 19,000 70 | 32,500 58.6* |

* Weighted.